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ABSTRACT

The diagnosis of children as learning disabled (LD) has become an increasingly popular diagnostic rubric, but the operational definition of "learning disabled" remains a vague, ill-defined construct which is based upon diagnosis by exclusion of other obvious causes. Diagnostic test results and cultural and familial information taken from case files of children who had been diagnosed as either LD, educable mentally handicapped, emotionally disturbed, or physically handicapped were examined relative to their discriminative efficacy in differentiating between the four diagnostic groups. A total of 1,596 children between the ages of 6 and 17 years, with close to average intelligence, were used in this study. Discriminant functions analyses were performed on 52 variables; these analyses consistently failed to discriminate LD children from the other three groups. A transpose factor analysis was performed on groups by chronological age, in intervals of three years. Finally, ANOVA's were performed on 17 variables. It was impossible to discriminate between the four diagnostic groups by any of these methods. A more appropriate diagnostic model which accounts for the child's unique processing (organizing, storing, rehearsing and retrieving) of information relative to his content base and ability to perform a corresponding behavior is proposed. (Author/CTM)

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AN INDIVIDUALIZED METHOD FOR ASSESSING THE "LEARNING DISABLED" CHILD

A paper presented at the Eighth Annual Conference of the Northeastern Educational Research Association, New York, October 1977

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AN INDIVIDUALIZED METHOD FOR ASSESSING THE "LEARNING DISABLED" CHILD

ABSTRACT

The diagnosis of children as "learning disabled" has become an increasingly popular diagnostic rubric. The operational definition of "learning disabled" remains a vague, ill-defined construct which is based upon diagnosis by exclusion of other obvious causes. Diagnostic test results and cultural and familial information taken from case files of children who had been diagnosed as either LD, EMH, ED or physically handicapped were examined relative to their discriminative efficacy in differentiating between the four diagnostic groups. A total of 1,596 children between the ages of 6 years, 0 months and 17 years, 0 months with about average intelligence as measured by the WISC or WISC-R ($\bar{X}$ FSIQ=87.30, sd=15.68) were used in this study. Discriminant functions analyses were performed on 52 variables selected from the above three sources of information. The results of these discriminant analyses consistently failed to discriminate LD children from the other three groups. In each instance a high percentage of children from the LD group were accurately diagnosed as LD. But very high percentages of children from the other three diagnostic groups were misclassified as LD on the basis of these data. A transpose factor analysis was performed on these variables in an effort to delineate potential factors that could discriminate between groups. The factor analysis was perfommed on C.A. groups in intervals of three years beginning with 6 years, 0 months to 17 years, 0 months. For each level, three factors were specified, yet there was considerable overlap of variables between factors. Finally, ANOVA's were performed on 17 variables (actual diagnosis, CA, MA, WISC subtest scores and IQ scores and WRAT word recognition and arithmetic

raw scores) from the three original sources of information and the three factors resulting from the factor analysis. Again it was impossible to discriminate between the four diagnostic groups. A review of research examining the discriminative efficacy of widely used diagnostic tests (WISC, WISC-R, ITPA, DTLA, Bender-Gestalt) indicates that these tests have little diagnostic utility in distinguishing LD from non-LD children. Specific recommendations regarding research design and multi-variate data analyses are suggested. A more appropriate diagnostic model which accounts for the child's unique processing (organizing, storing, rehearsing and retrieving) of information relative to his content base and ability to perform a corresponding behavior is proposed.

INTRODUCTION

In the past decade the diagnosis of school-aged children as learning disabled (LD) has become an increasingly popular practice. Despite the large number of studies investigating the deficits exhibited by the learning disabled child, both the theoretical and operational definitions of LD remain a vague, poorly defined construct usually based upon diagnosis by exclusion of other disabilities. For example, LD has been referred to by 37 other different diagnostic rubrics (Divoky, 1973) to include neurological impairment, MBD, cerebral dysfunction, psychoneurotic inefficiency, post encephalitic behavior disorder and neurosensory disorders. Depending on the criteria used to define LD, estimates of its incidence range from 1% to 30% of the total school population (Wender, 1971; Denhoff, 1971, McGrady and Griffen, 1970). The most commonly agreed upon definition is that developed by the National Advisory Committee on Handicapped Children (1968):

> *Children with special learning disabilities exhibit a disorder in one or more of the basic psychological processes involved in understanding or using spoken or written languages. These may be manifested in disorders of listening, thinking, talking, reading, writing, spelling or arithmetic. They include conditions which have been referred to as perceptual handicaps, brain injury, minimal brain dysfunction, dyslexia, developmental aphasia, etc. They do not include learning problems which are due primarily to visual, hearing or motor handicaps, to mental retardation, emotional disturbance, or to environmental disadvantages. (p. 4)*

This definition explicitly delineates what is not a learning disability. Unfortunately, this type of dialectical reasoning fails to provide a tangible, parametric operational definition for LD.

The diagnostic label assigned to an individual frequently dictates the specific treatment intervention program to be employed. Ideally, the diagnosis of LD (or any other diagnosis) should be based on the child's objective

performance in a variety of individually administered diagnostic, psychological and educational tests. These test data used in conjunction with familial and cultural information are then used to determine both diagnosis and the most appropriate educational (and psychological) placement for a child with learning problems. This study examines the discriminative utility of diagnostic test data in conjunction with cultural and familial information in differentiating LD children from non-LD children.

METHODS

Subjects

The case files of 1,596 children between the ages of 6 years, 0 months and 17 years, 0 months [$\bar{X}$ CA=10.59 years, s.d.=3.53] who had been referred by classroom teachers to a special education diagnostic team because of learning and/or social adjustment problems were examined. As a result of diagnostic assessment, all children had been labelled as either LD, emotionally disturbed (ED), educably mentally handicapped (EMH), physically handicapped or other (meaning that no clear diagnostic label was available although the child received special education services) and placed in appropriate remedial educational programs. All children were of about average intelligence as measured by performance on the WISC and/or WISC-R. The mean VIQ score was 85.89 (s.d.=15.78), while the mean PIQ score was 90.53 (s.d.=16.21) and the mean FSIQ score was 87.30 (s.d.=15.68). The mean MA was 9.08 years (s.d.=3.07) with a mean grade level in school of 4.83 (s.d.=3.15).

Procedures

Cultural and familial information and test data on the children were collected from their case folders. Cultural information included SES and

type of residential area (urban, suburban or rural). Familial information included the predominant use of a second language in the home, whether either parent(s) had a learning problem which interfered with their school performance, whether the child had a neurological examination and if so had a definite diagnosis been established as to the presence of a neurological dysfunction, the results of a medical examination which resulted in a definite diagnosis and a history of neurological dysfunction in the family (parents, siblings with neurological problems). Other data included the child's sex, expected level of achievement in school, had specific educational programs been used before with the child and if so how effective were they and reason for referral. Diagnostic test data consisted of the ten subtest scales of the WISC and/or WISC-R, the mean scale scores for the verbal and performance scales and the grade equivalent scores for the three subtests of the WRAT.

Statistical Analyses

A series of discriminant functions analyses were performed on different combinations of the variables from the above sources of information. These variables included CA, MA, history of parent learning problem, presence of a neurologically defined disorder or a medically defined disorder, grade placement in school, grade equivalent scores on the WRAT, WISC and/or WISC-R subtest scores, which members of the special education diagnostic team diagnosed the child into one of the five diagnostic categories, and expected level of achievement. Based on the findings from the discriminant analyses a transpose factor analyses was performed on the same variables to further delineate differences in diagnostic criteria which discriminated between groups. The factor analyses were performed on CA groups in intervals of three years beginning with 6 years, 0 months through 17 years, 0 months. Finally, ANOVA's

were performed on 14 variables from the three original sources of data and the three factors resulting from the factor analyses. These variables included actual diagnosis, CA, MA, WISC subtest scale scores and IQ scores and WRAT word recognition and arithmetic raw scores.

RESULTS

The discriminant functions were performed in an attempt to delineate the diagnostic utility of norm-referenced objective test data and personal information in differentiating LD children from EMH, ED, physically handicapped and "other-diagnosed" children. The first discriminant analysis, from which three functions were derived, was performed on the total group of children who had been placed into one of the five possible categories using the 10 subtest scales of the WISC and/or WISC-R and the three subtest scales from the WRAT. A total of 58.48% of the cases were correctly classified using only these data. However, the majority of cases from the EMH, ED, physically handicapped and ungrouped categories were inaccurately classified as LD. It was possible to accurately differentiate only the EMH group from the other diagnostic groups. Unfortunately, this was accomplished with only 52% accuracy. Variables included in the prediction equation were vocabulary, object assembly, coding, word recognition (WRAT), comprehension, arithmetic and picture arrangement. Another discriminant analysis was performed on the total group of children using the three IQ scores from the WISC and/or WISC-R and the three subtests from the WRAT. A canonical correlation of +.540 was obtained. Although 61.37% of the total cases were correctly classified, 77.76% of the cases of children who were not diagnosed as LD by the special education team were classified and predicted to be LD on the basis of these test data. Because these first two discriminant analyses failed to provide information regarding diagnostic test performance differentiating

between the diagnostic groups, it was decided to place several constraints on further analyses to minimize possible external sources of variance. These were elimination of the physically handicapped group from the next two analyses, a minimum IQ level of 75 to reduce the influence of low IQ scores (and theoretically the EMH group), an MA range of 6-17 years, and a CA range of 6-17 years. Unfortunately, these constraints failed to clarify test scatter pattern differences related to a diagnostic label. A total of 73.65% of the cases were correctly classified, but 84.32% of non-LD diagnosed children were predicted to be classified as LD on the basis of performance in the testing. Substitution of the three WISC and/or WISC-R IQ scores for subtest scores yielded similar results. Two final discriminant functions were performed using either the WISC and/or WISC-R subtest scales or the three WISC and/or WISC-R IQ scores in combination with CA, MA, grade level in school, expected level of achievement, 40% of expected level of achievement, and the three WRAT subtest scales. Constraints on the population included MA between 5-17 years, CA greater than six years and FSIQ scores equal to 75 or higher. Again, the findings were quite discouraging. In each instance, 73.07% of the cases were correctly classified, but significantly high percentages of non-LD children were also predicted to be LD on the basis of these data. Table I summarizes the results of these six discriminant functions analyses.

Insert Table I about here

For each of the six discriminant function analyses the word recognition subtest from the WRAT proved to be a significant variable in differentiating between all groups. Within the total group, the EMH's ($\bar{X}$ ge level=2.77) and LD's ($\bar{X}$ ge level=2.85) performed poorest on this subtest while the ED group performed best ($\bar{X}$ ge level=3.86). This pattern was also found when the WRAT

and WISC and/or WISC-R IQ scores were used in combination. For the remaining four discriminant analyses, the EMH group performed at a slightly higher grade equivalent level on the WRAT word recognition subtest than the LD group. The ED group continued to perform best of all on this subtest.

Insert Table II about here

Only the Comprehension and Block Design subtests of the WISC(R) consistently differentiated between groups. For the total group LD labelled children had the highest WISC(R) Comprehension scores while the EMH diagnosed group had the lowest scores. When the physically handicapped diagnosed group was partialled from the group this same pattern was found. In the Block Design subtest, the ED diagnosed group performed slightly higher than the LD group. Both groups performed much better than the EMH group. Finally, in the three discriminant functions analyses using the WISC-R IQ scores, FSIQ served to reliably differentiate between groups. The ED diagnosed group had the highest FSIQ ($\bar{X}$ FSIQ=92.29) while the LD group was only slightly lower ($\bar{X}$ FSIQ=91.40). Even though one of the constraints in the discriminant analysis was that IQ scores below 75 were eliminated to remove the EMH diagnosed, an EMH diagnosed group still emerged from the data analysis. The mean FSIQ score for this group was 84.44.

Because the results of the discriminant functions failed to discriminate between groups, it was decided to attempt to classify children into groups on the basis of MA and performance on the WISC (R) and WRAT by CA level in intervals of three years beginning with 6 years, 0 months through 17 years, 0 months using a transpose factor analyses. Physically handicapped labelled children were eliminated from this analysis. Although three factors were derived from the factor analysis, it appears that these factors do not

correspond to the descriptor labels assigned to the diagnostic groups.

Insert Table III about here

For each of the four CA levels each factor accounted for a good percentage of the variance, but inspection of the factor loading tables shows that only 40.0% to 42.42% of the cases given a diagnostic label were correctly classified under 1 of the 3 factors. Further, there was a good degree of overlap of variables between the 3 factors. Table III contains a summary of the percentage of variance accounted for by each factor and the number of cases grouped for each factor. Finally, the ANOVA's also failed to specify factors discriminating between diagnostic labelled groups.

DISCUSSION

Although it cannot be said that the WISC-(R), the WRAT and other personal information about a child are totally useless in discriminating between different diagnostic classifications of children, it appears that at different age levels and under different IQ levels, different facets of the testing are attended to more than others. Across all diagnostic groups, though, the three most significant variables attended to appear to be the child's reactions to and stated behavior in various social situations as measured by the Comprehension subtest of the WISC-(R), a general estimate of cognitive ability and potential as measured by the WISC-(R) FSIQ score, and the ability to phonemically analyze and synthesize individual words as measured by performance on the Word Recognition subtest of the WRAT. In essence, if a child is of about average ability and functioning at a low grade level as measured by a reading achievement test, there is a tendency to be diagnosed as LD. If the estimate of the child's overall intelligence falls within the dull normal or

borderline defective range and the child is performing at around expected levels of achievement in word analysis, he is diagnosed as EMH. Finally, if the child is of about average intelligence and performing close to grade level on the reading achievement test, yet is still having problems in learning, he is diagnosed as ED. An aside regarding the significant emphasis placed on the Word Recognition subtest from the WRAT is that one of the common findings for reading disabled children is that they do poorly on phonemic analysis and synthesis of isolated words (Schankweiller and Liberman, 1972).

Previous research investigating the utility of WISC-(R) subtest patterns in differentiating various classifications of children and especially reading disabled (Belmont and Birch, 1966; Coleman and Rasof, 1963; Hirst, 1960; Reid and Schoer, 1966; Keogh, Wetter, McGinty and Donlon, 1972) and learning disabled children (Koppitz, 1975) have been confusing and contradictory. The predictive validity and diagnostic utility of other frequently used standardized tests such as the ITPA (Newcomer and Hammill, 1976), the Detroit Test of Learning Aptitude (Anastasi, 1938; Bruininks, 1969; Nelson and Hudson, 1969) and the Bender-Motor Gestalt Test (Nielson and Ringe, 1969; Benton, 1962; Rosen, 1966; Pick, 1970; Critchley, 1970) have also left much to be desired. From the great amount of research demonstrating the lack of diagnostic usefulness of widely used standardized diagnostic instruments, it seems obvious that several modifications are needed in the manner in which diagnostic assessment is being conducted. The construct LD seems to be more than the mere polymorphous entity as it is currently characterized. Recent research by Bloomer (1977) has clearly differentiated at least three subtypes of LD children. The first group is described as having motivation problems with low frustration tolerance levels and an apathetic attitude toward school achievement. A second group is comprised of a very small percentage of children who display an

apparent visual and/or auditory perceptual deficit. Finally, the third group tends to be children who are slow in acquiring new knowledge and information. They tend to be overly reflective and need time to reach a solution to a problem but are in no way dull or stupid.

Statistical procedures and experimental designs currently used in research investigating diagnostic patterns suggestive of LD should move away from the traditional single factor linear measurement model. It is plausible that learning disabilities is a multi-level, multi-factorial deficit. As such, multi-variate statistical procedures appear to be most appropriate. Further, it seems counter-productive to continue comparing the performance of LD children to normals of equal MA and/or equal CA on diagnostic tests. Rather, investigation of within-group behavioral clusters associated with learning problems may be more productive in specifying etiological components for specific learning deficits.

A recurring issue in the area of assessment is that of separating a behavioral deficit from a content deficiency (Cawley, 1977). For example, does a 12 year old child who correctly answers the first 70 items on the Peabody Picture Vocabulary Test (Dunn, 1965) and fails all subsequent items and obtains an IQ estimate of 74 really have an intellectual potential in the borderline defective (Wechsler, 1949) range? If the child can perform the behavior of associating an aural input with the correct response selected from a visual array 70 times, is the problem one of receptive language (and, by inference, low IQ) or does the child have a content deficiency resultant of several potential factors such as individual mood fluctuations, SES, or cultural and educational deprivation? It seems reasonable to assume that if the child can perform a behavior 70 times then it is not a behavioral deficit. Rather, it is a content deficiency. An analogous situation exists for other

standardized tests such as the ITPA, the Detroit Test of Learning Aptitude and WISC. Finally, one of the main limitations of norm-referenced testing is that it fails to account for individual variation in featural detection and analysis of auditory and visual inputs and individual nuances in organizing, sequencing and rehearsing newly acquired information in short term memory stores. As part of the diagnostic assessment one must attend to how the child organizes incoming information both internally and externally (Spitz, 1966; Gerjuoy and Spitz, 1966). The child's unique information processing strategies relative to specific behavioral deficits as separate from content deficiencies should also be taken into account.

Table I

Summary of Discriminant Functions Analyses Indicating
Percents of Children Correctly Classified
and of Children Mis-Classified as LD

	Group Diagnostic Labels Included	1st Canonical r	% of Cases Correctly Predicted	% of Other Diagnostic Cases Predicted LD	Variables Used in Analysis
I	LD, EMH, PH, ED, Ungrouped* (Total Group)	.587	58.48	69.04	10 WISC subtest scales and 3 subtest scales from the WRAT
II	Total Group	.540	61.37	77.76	3 WISC IQ scores and the 3 subtest scales from the WRAT
II	LD, EMH, ED, Ungrouped*	.332	73.65	84.23	10 WISC subtest scales, MA, CA, Word Recognition and Arithmetic subtests of WRAT. Constraints: minimum IQ=75, MA range 6 to 17, CA range 6 to 17 years
IV	LD, EMH, ED, Ungrouped*	.333	72.41	86.42	3 WISC IQ scores, MA, CA, Word Recognition and Arithmetic subtests of WRAT. Constraints: minimum IQ=75, MA range 6 to 17, CA range 6 to 17 years
V	LD, EMH, ED, Ungrouped*	.320	73.07	84.75	10 WISC subtest scales, CA, grade placement in school, MA, expected level of achievement, 40% of expected level of achievement, 3 WRAT subtest scales, SES. Constraints: MA range between 5 to 17, CA greater than 6, IQ greater than 75
VI	LD, EMH, ED, Ungrouped*	.295	73.07	85.60	3 WISC IQ scores, 10 WISC subtest scales, CA, grade placement in school, MA, expected level of achievement, 40% of expected level of achievement, 3 WRAT subtest scales, SES. Constraints: MA range between 5 to 17, CA greater than 6, IQ greater than 75

*No clear diagnostic label available although placed in special education

Table II

Summary of Means for Significant Variables
Obtained for each of the 6 Discriminant Functions Analyses

		M E A N S					
	Variables	LD	EMH	ED	PH	F-Level	P-Level
I	Vocabulary	8.08	4.69	8.68	8.47	46.16	.001
	Object Assembly	9.48	6.55	10.40	9.62	14.37	.001
	Coding	6.78	5.13	8.0	8.45	8.64	.001
	Word Recognition (6E)	2.85	2.77	3.86	3.31	7.61	.001
	Comprehension	8.49	5.29	8.43	8.46	7.07	.001
	Arithmetic	6.94	4.82	8.06	7.93	3.88	.01
	Picture Arrangement	9.3[illegible]	6.08	9.86	9.54	3.32	.01
II	FSIQ	87.07	69.10	91.86	88.33	66.56	.001
	Word Recognition (6E)	2.85	2.77	3.86	3.31	6.10	.01
III	Word Recognition (6E)	2.90	2.97	3.82	-	6.07	.002
	Comprehension	9.01	7.13	8.62	-	5.43	.004
	Block Design	9.16	7.78	9.78	-	4.24	.01
	MA	10.01	9.17	10.08	-	3.65	.02
IV	Word Recognition (6E)	2.90	2.97	3.82	-	6.07	.002
	FSIQ	91.40	84.44	92.29	-	5.82	.003
	MA	10.01	9.17	10.08	-	2.63	.06
V	Word Recognition (6E)	12.87	2.97	3.82	-	6.63	.001
	Comprehension	8.99	7.13	8.62	-	5.29	.005
	Block Design	9.16	7.78	9.78	-	4.22	.01
	CA	11.03	10.91	10.92	-	4.11	.01
VI	Word Recognition (6E)	2.87	2.97	3.82	-	6.63	.001
	FSIQ	91.36	84.44	92.29	-	5.82	.003
	CA	11.03	10.91	10.92	-	2.99	.04

Table III

Summary of the Results Obtained from the Transpose Factor Analysis

CA Levels		% of Variance Accounted by Each Factor		Load on Factor (N's) A	B	C
6 yrs. to 8 yrs., 11 months	A	26.7	LD	11	15	4
(N = 50)	B	25.8	EMH	2	3	1
	C	24.9	ED	6	2	6
Correctly classified 40%						
				A	B	C
9 yrs. to 11 yrs., 11 months	A	27.8	LD	33	25	18
(N = 99)	B	24.0	EMH	1	3	2
	C	21.9	ED	7	3	6
Correctly classified 42.42%						
				A	B	C
12 yrs. to 14 yrs., 11 months	A	29.8	LD	19	12	3
(N = 50)	B	25.3	EMH	3	2	1
	C	24.5	ED	7	3	0
Correctly classified 42%						
				A	B	C
15 yrs. to 16 yrs., 11 months	A	27.7	LD	11	9	6
(N = 40)	B	26.7	EMH	0	2	1
	C	26.0	ED	4	4	3
Correctly classified 40%						

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